Docket No. AUS920010453US1

PROXIMITY-BASED MOBILE TELEPHONE BILLING INTERVENTION

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention is directed generally toward administering a mobile telephone service. More specifically, the present invention is directed toward allowing a change in the billed party in a mobile telephone call.

2. Description of Related Art:

The mobile telephone has ushered in a new era in interpersonal communications. While the late 1990s' widespread consumer interest in the Internet made ours a wired world, technical advances and increased consumer appeal are ushering in a new "wireless world." A number of mobile telephone manufacturers and service providers cater to a growing base of mobile telephone subscribers. Unlike most local telephone service in the United States, but akin to long-distance service, mobile telephone service is usually billed in minutes of airtime. That is, the amount a customer is charged is proportional to the amount of time spent in mobile telephone calls. For instance, a five minute call will usually cost five times as much as a one minute call.

Because having every minute of every call charged for is a major discouragement to consumers wishing to use mobile telephones, mobile service providers often employ a billing system in which customers pre-pay for a certain number of minutes of airtime each month. When a customer makes a call, the minutes of airtime are subtracted from

the customer's balance of minutes for the month. Any additional minutes exceeding the customer's pre-paid balance are billed for separately. In most billing schemes, the current month's minutes expire at the end of the month if not used.

Mobile telephones, by their very nature, may be used virtually anywhere, including in stores and other establishments. It would be desirable, therefore, if establishments could provide an incentive to their customers by paying for their customers' airtime and/or other telephone charges while on the premises.

SUMMARY OF THE INVENTION

The present invention provides a method, computer program product, and data processing system for allowing a third party to assume a mobile telephone user's airtime and other charges when the mobile telephone user enters a particular geographic area, such as the third party's property.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1A is a diagram of a mobile telephone with which the processes of the present invention may be implemented;

Figure 1B is a block diagram of a mobile telephone with which the processes of the present invention may be implemented;

Figure 2 is a diagram of the operation of a mobile telephone system in which the present invention may be implemented;

Figure 3A is a diagram depicting a billing intervention system in accordance with a preferred embodiment of the present invention;

Figure 3B is a block diagram of a telephone service provider data processing system in which the processes of the present invention may be executed;

Figure 4 is a diagram of a radio-frequency identification (RFID) tag usable in a preferred embodiment of the present invention;

Figure 5 is an illustration of how a radio-frequency identification tag may be used within a preferred embodiment of the present invention;

Figure 6A is a diagram demonstrating a process of signal triangulation as a means of locating a mobile telephone in a preferred embodiment of the present invention;

Figure 6B is a diagram demonstrating a process of using the Global Positioning System (GPS) as a means of locating a mobile telephone in a preferred embodiment of the present invention;

Figure 7 is a diagram of a database storing information about various locations in which third-parties agree to pay for mobile telephone service used within the location;

Figure 8 is a diagram of a database holding information about telephone service accounts in a preferred embodiment of the present invention; and

Figure 9 is a flowchart representation of a process of providing proximity-based mobile telephone billing intervention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 depicts an exemplary mobile telephone **100** with which the processes of the present invention can be implemented. Mobile telephone **100**, for instance, could be a Talkabout® T8167 Mobile Telephone from Motorola, Inc. of Schaumberg, Ill. Like a conventional telephone, mobile telephone **100** contains an earpiece **102**, a microphone **104**, and a keypad **106** for emitting DTMF (Dual-Tone Multiple Frequency) tones for dialing. Mobile telephone **100**, unlike a conventional telephone, uses an antenna **108** as its communications link to the Public Switched Telephone Network (PSTN), the standard public telephone network through which most telephone calls are routed. Mobile telephone **100** may transmit and receive data, including but not limited to voice data, through an analog-coded or digitally coded signal. One common communications standard for mobile telephones is the PCS (Personal Communications Services) standard, which uses digital signal coding. Some mobile telephones, such as dual-band mobile telephones, will allow multiple communications standards to be used with the same telephone; this is a convenience, particularly in remote areas where some communications protocols are not available.

Mobile telephone **100** includes a "send" button **110** and an "end" **112** button for initiating and terminating calls, respectively. To dial another telephone, a user enters the telephone number for that telephone on keypad **106** and presses "send" button **110** to place the call. To "hang up" or terminate the call, the user presses "end" button **112**.

Mobile telephone **100** also includes a liquid-crystal diode (LCD) display **114** for indicating to a user the status of mobile telephone **100**, such as when mobile telephone **100** is dialing. In some mobile telephones, display **114** may be used for executing software, such as games, or for browsing World Wide Web documents loaded from the Internet through a wireless connection using antenna **108**.

A user of mobile telephone **100** will generally rely on a service provider to provide a wireless gateway into the PSTN. In addition to allowing a user to send and receive telephone calls, a service provider may provide additional features to customers. One of these features, as was already mentioned, is wireless Internet access. Another is voice mail. If the user of the mobile telephone **100** is unavailable (i.e., has turned off mobile telephone **100**, is already talking to someone using mobile telephone **100**, or simply ignores the ringing mobile telephone **100**), a caller calling mobile telephone **100** can be switched into a voice mail service, where the caller can leave a message for the user of mobile telephone **100**. An indicator, such as an envelope icon, can appear in display **114**. The user of mobile telephone **100** can later access the voice mail service by pressing a special voice-mail button **116** or by calling a special telephone number (such as *123, for instance) or by calling the user's own number. The user can then use keypad **106** to enter DTMF tones to select recited voice mail menu options.

Mobile telephone **100** will generally run on some kind of battery power using a rechargeable battery pack, or

the like. To conserve energy when mobile telephone **100** is not needed, power button **118** may be used to turn off and later turn on mobile telephone **100**. When mobile telephone **100** is turned off, it cannot send or receive calls, although voice mail services are still available. **Figure 1B** is a block diagram of mobile telephone **100**. Bus **120** provides the central backbone through which the electronic components of mobile telephone **100** communicate.

Attached to bus **120** is a communications circuitry module **122**, which transmits and receives mobile telephone signals through antenna **124** using one of a number of transmission and multiplexing schemes available for wireless communications including, but not limited to, FDMA (frequency division multiple access), TDMA (time division multiple access), CDMA (code division multiple access), and GSM (global system for mobile communications).

Communications circuitry module **122** and other components of mobile telephone **100** are controlled by processor **126** which may be a general-purpose microprocessor, such as a PowerPC microprocessor, or a digital signal processor or other specialized processor. Processor **126** executes program code stored in memory **128** to direct the operation of mobile telephone **100**. Processor **126** also uses memory **128** to store data, such as frequently-dialed telephone numbers.

A variety of input-output (I/O) components communicate with processor **126** through bus **120**, including keypad **130** and liquid-crystal display (LCD) **132**. Analog-to-digital converter **134** takes analog audio

information from microphone **136** and converts it to a digital data representation for transmission over bus **120**. Likewise digital-to-analog converter **138** takes digital data from bus **120** and converts it into audio for presentation through earpiece speaker element **140**. All of these I/O components communicate with and are coordinated by processor **126**. For example, digital audio data created by analog-to-digital converter **134** is retrieved by processor **126**, prepared for transmission by processor **126**, and then sent to communications circuitry module **122** for transmission over antenna **124**. To take another example, a telephone number entered by a user using keypad **130** is retrieved by processor **126**, which generates DTMF tones for transmission by communications circuitry module **122**. Processor **126** then displays the entered telephone number on LCD display **132** to the user. **Figure 2** is a diagram depicting the operation of a mobile telephone **202** within a telephone system **200**. Mobile telephone **202** communicates with antenna tower **204**, sending and receiving voice and other data, such as Internet data. Service provider facility **206** connects antenna tower **204** with Public Switched Telephone Network (PSTN) **208**. Service provider facility **206** also performs such tasks as recording the number of minutes mobile telephone **202** stays connected on a call and providing voice mail and Internet services.

PSTN **208** connects service provider facility **206** with other communications devices such as telephones **210** and **212** and (by way of a service provider and antenna tower) mobile telephone **214**. One of ordinary skill in the art will recognize that many communications devices that are

not telephones may be connected to PSTN **208** and thus accessible by mobile telephone **202.**

One of ordinary skill in the art will also recognize that multiple service providers may be present within the same geographic area. In the diagram, service provider facility **209** represents an additional service provider in competition with the operators of service provider facility **206.**

Figure 3A is a diagram of a proximity-based mobile telephone billing intervention system in accordance with a preferred embodiment of the present invention. The proximity-based mobile telephone billing system in **Figure 3A** changes the billed party in a mobile telephone conversation taking place in a given geographic area to a pre-determined third party. Mobile telephone **340** communicates through network **342** with other parties as depicted in **Figure 2.** Network **342** comprises wireless and wired networks, including PSTN **208** of **Figure 2.** Proximity sensing system **344,** a data processing system also connected to network **342,** provides information about the location of mobile telephone **340.**

Facility sensors **346** associated with the location in which billing is to be assumed by a third-party detect the presence of mobile telephone **340** within that location. One such way to do this is depicted in **Figures 4** and **5,** which demonstrate how a Radio-Frequency Identification (RFID) tag can be affixed to mobile telephone **340** to identify it within the location in question.

Triangulation system **348** may use measurements of transmission times between mobile telephone **340** and

mobile telephone antenna towers in communication with mobile telephone **340** to establish the location of mobile telephone **340** through triangulation. This process is depicted in **Figure 6A**. Alternatively, triangulation system **348** may make use of the Global Positioning System (GPS), the operation of which is described in **Figure 6B**. Proximity sensing system **344** may use either or both of facility sensors **346** and triangulation system **348** to establish the location of mobile telephone **340**. Alternatively, any other means of determining the location of mobile telephone **340** could be used instead. Proximity sensing system **344** may make use of location database **349**, which is depicted in **Figure 7**, to identify locations in which billing intervention should take place. Proximity sensing system **344** notifies telephone provider server **350** that mobile telephone **340** is present within the location in question.

Telephone provider server **350**, a data processing system, adjusts values in billing database **352** to charge mobile telephone airtime or other charges for mobile telephone **340** to an intervening party that has agreed to pay for mobile telephone customers' airtime in the location in question. A billing database such as **352** is described in **Figure 8**.

Figure 3B is a block diagram of a data processing system **300** in which the processes and computer program product instructions of a preferred embodiment of the present invention may be implemented. Preferably data processing system **300** will be associated with equipment operated by a mobile telephone service provider. For example, data processing system **300** may be associated or

located in service provider facility **206** in **Figure 2**. Data processing system **300** includes a (central) processing unit **302** connected to a local bus **304**. Processing unit **302** executes instructions stored in memory **306**, which is also connected to local bus **304**. Processing unit **302** may comprise a single processor, such a microprocessor, or it may comprise multiple processors so as to allow the execution of multiple instructions simultaneously. Any number of processors could be used in processing unit **302**. An example of a suitable processor is the PowerPC microprocessor, developed by IBM Corporation of Armonk, New York.

Many different types of memory are available and suitable for use within data processing system **300**. Memory is generally classified as volatile and non-volatile memory. Volatile memory types store data temporarily while the data processing system is operating, but lose their data once the data processing system's power is turned off. Most volatile memory in use today is "random access memory," (RAM) meaning that data and instructions may be read from or written to any portion of the memory at any time. Common random access memory types well-known to those skilled in the art include static random access memory (SRAM) and dynamic random access memory (DRAM).

Non-volatile memory types retain their information, even when the data processing system is turned off. Non-volatile memory types are generally referred to as "read-only memories" (ROM). Many types of non-volatile memories exist. Programmable read-only memory (PROM) may be programmed with permanent data using a PROM programming device. Erasable programmable read-only

memory (EPROM) can be erased of its data contents, through such means as ultraviolet radiation or through electric current (as with an electrically-erasable PROM or EEPROM). Flash memory and non-volatile random-access memory (NVRAM) are two memory media that may be written to and erased within working circuits without the use of a memory programming device.

Memory **306** may store data to be operated upon by processing unit **302**, it may store instructions to be executed by processing unit **302**, or it may store both. In **Figure 3B**, a single memory module is depicted, although many memory arrangements are possible. Cache memory, which is a high speed memory used for temporary storage of data and instructions to be stored to read from a primary bank of memory may be used. Also, certain systems designed with what is known as a "Harvard architecture" use separate memory and buses for data and instructions.

PCI bus bridge **308** connects local bus **304** to PCI input/output (I/O) bus **310**. PCI I/O bus **310** is what is known as a backplane bus. A backplane bus is not connected directly to a central processing unit, but communicates with the central processing unit via a bus bridge. Peripheral devices, such as disk drives and other input/output and storage devices typically connect to backplane buses. Having a separate backplane bus prevents peripheral device malfunctions from interrupting the operation of the central processing unit (processing unit **302**).

Secondary storage **312** is connected to PCI I/O bus **310**. Secondary storage **312** may comprise one or more disk drives, magnetic tape drives, optical storage devices, or

other persistent storage medium. Secondary storage **312** preferably stores relatively large amounts of data and instructions compared to memory **306**. Secondary storage **312** may be used for permanent storage of data or instructions, such as a database, or secondary storage **312** may be used to supplement memory **306** with additional storage space. One common method of providing additional storage space to augment memory **306**, called virtual memory, involves swapping portions of data, called pages, between memory **306** and secondary storage **312** such that pages are addressed and located in memory **306** when in use, but swapped out to secondary storage **312** when not in use.

Also connected to PCI I/O bus **310** is a telephone interface device **314**. Telephone interface device **314** includes a PCI I/O adapter **316** connected to PCI I/O bus **310**. PCI I/O adapter **316** allows telephone interface device **314** to communicate through PCI I/O bus **310**. PCI I/O adapter **316** is connected to telephone interface system bus **318**, which connects the various components of telephone interface device **314**. An embedded processor **320** is preferably some sort of microprocessor, such as a Z80 microprocessor, manufactured by Zilog, Inc. Embedded processor **320** executes instructions stored in memory **322**, which is also attached to telephone interface system bus **318**. Embedded processor **320** interprets commands communicated through PCI I/O adapter **316** and, in response, directs the operation of telephone interface device **314**. Embedded processor **320** operates on data, which it stores and retrieves in memory **322**. Alternatively, a microcontroller, such as an 8051

microcontroller, manufactured by Intel Corporation, could be used in place of embedded processor **320** and memory **322**. A microcontroller is a monolithic integrated circuit containing both a processor unit and memory. Dual Tone Multiple Frequency (DTMF) decoder **324** interprets DTMF tones from telephone network line **326**, translating the tones into corresponding numbers from a telephone keypad. DTMF decoders are available as monolithic integrated circuits from a number of vendors. DTMF decoder **324** reports the numeric interpretation of the DTMF tones to embedded processor **320** through telephone interface system bus **318**.

Telephone network line **326** can be connected directly into the Public Switched Telephone Network, perhaps using a DSL (Digital Subscriber Line) modem. It may also be connected through a local-area network (LAN) using, for example, an RJ45 modular connector for an Ethernet LAN, perhaps connected to a T1 line (a high-bandwidth network line). Although a standard analog telephone line may be used, a more likely option would be utilize a digital telephone line instead.

Telephone line control system **329** acts under the control of embedded processor **320** to "pick up" or "hang up" telephone network line **326**. Telephone line control system **329** also detects when telephone network line **326** is "ringing."

Embedded processor **320** transmits audio messages across telephone network line **326** by transmitting digital audio data (which may include voice, indicator chimes, DTMF signals, or any other audio signal) from memory **322** through communication module **330**.

Figure 4 is an example of a radio-frequency identification (RFID) tag **400** (not to scale). The tag **400** includes an integrated circuit **410** containing non-volatile memory, logic circuitry, and communications circuitry. This integrated circuit is attached to an antenna **420**, which in this example is implemented as an inductor coil. All of this electronic equipment is fabricated onto a substrate, which in this example is a clear, flexible film.

This tag **400** may be written to or read from by subjecting it to a radio-frequency signal. The integrated circuit **410** reads the radio-frequency signal from the antenna **420** and interprets the signal as a command to read or write data to or from memory located on the integrated circuit.

Note that there is no power supply located on the tag **400**. The integrated circuit **410** collects all of its power from the energy in the radio-frequency signal. This allows the tags to be easily and inexpensively produced and allows them to be used in a variety of environments where a device that had to supply its own power could not be used. An example of such an environment would be one in which the bulk of a power supply would be prohibitive.

RFID tags provide a ready form of identification or marking of an object. Identification information can be written to an RFID tag, where it becomes readable by any compatible reader. The kinds of information that may be stored in an RFID tag are essentially all of the same kinds of information that may be stored in a computer or other data processing system. Thus, an RFID tag identifying an item of merchandise, for instance, may

include such information as the name of the product, price information, a serial number, a UPC (Universal Product Code), or any other data a merchant or manufacturer may choose to include.

Figure 5 shows how RFID technology may be used to identify when a mobile telephone user **500** enters a particular location. Mobile telephone user **500** enters a retail establishment **503** through entrance **502**. As mobile telephone user **500** enters through entrance **502**, sensors **504** read mobile telephone user's account number from the contents of an RFID tag attached to mobile telephone user **500**'s mobile telephone. This telephone account number can then be forwarded to telephone provider server **350** (**Figure 3A**) to request that the retailer be billed for mobile telephone user **500**'s calls, rather than mobile telephone user **500**. When mobile telephone user **500** exits retail establishment **503**, sensors **504** will again read the RFID tag, then notify telephone provider server **350** that the provider is to resume billing mobile telephone user **500**.

Figure 6A demonstrates the operation of an alternative embodiment of the invention utilizing the triangulation of mobile telephone signals to determine the location of the telephone user. At point **600**, in building **605**, a mobile telephone user holds a mobile telephone that is in communication with three mobile telephone antenna towers **610**, **620**, **630**. The three towers **610**, **620**, **630** and the mobile telephone contain clocks that are synchronized with each other.

When the mobile telephone emits a signal, the three antenna towers **610**, **620**, **630** receive the signal at

different times. This is because the distances **640, 650, 660** from the antenna towers **610, 620, 630** to point **600** are different. By calculating the time it takes for a given signal to reach an antenna station and multiplying that result by the speed of light, a known physical constant, the distances **640, 650, 660** can be obtained. Knowing the positions of the antenna stations **610, 620, 630** and knowing the distances **640, 650, 660** makes it possible to find loci of points **670, 680, 690** denoting the possible locations of the mobile telephone as determined from the point of view of each antenna tower **610, 620, 630.** These loci **670, 680, 690** are simply circles with radii equal to the distances **640, 650, 660** between point **600** and the antenna stations **610, 620, 630.** Where all three loci **670, 680, 690** intersect is the location of the telephone, point **600.**

Figure 6B depicts how the process of determining the position **641** of the mobile telephone on the earth **642** can be performed using a GPS receiver associated with the mobile telephone. GPS satellites **643, 645, 646** each contain an atomic clock and emit timing signals that are precisely synchronized. The GPS receiver at the mobile telephone's location **641** is also synchronized with the satellites **643, 645, 646.** Thus, when the GPS receiver receives the signals from the satellites **643, 645, 646,** it notes how long it took for the signals to reach the receiver. By determining the time it took for the signal to reach the receiver, the GPS receiver determines the distance to each of the satellites **643, 645, 646** from the receiver's location **641.** Those distances are graphically represented in **Figure 6B** by spheres **647, 648, 649.**

An electronic almanac is stored within the GPS receiver, which allows the receiver to know the exact locations of the satellites **643, 645, 646** at any given time. Knowing the locations of three satellites **643, 645, 646,** their distances from the receiver **641,** and that the satellites **643, 645, 646** orbit the earth **642** at a vertical distance of 11,000 miles, allows the receiver to calculate its latitude and longitude on the earth, which is a position within the intersection of the three spheres **647, 648, 649.** If four satellites are available, the altitude of the receiver can be calculated as well.

The proper party to be billed when a user enters a particular location, as determined by triangulation or other means, may be determined by making reference to a location database such as database **700** in **Figure 7.** Database **700** contains fields for an intervener **702** who is to be billed for mobile telephone conversations taking place within a given area, a "northwest" coordinate **704,** and a "southeast" coordinate **706.** Northwest coordinate field **704** and southeast coordinate field **706** together define a rectangular geographic area for each location where charges are to be assumed by an intervener in intervener field **702.** Areas with complex shapes may be represented in database **700** as a number of entries representing adjacent rectangular areas of different sizes, or alternatively through the recitation of a number of vertices defining an arbitrary polygon or any other form of geometric representation.

Database **700** and the databases in **Figure 8** may be implemented using any of a number of database infrastructures, including (but not limited to)

relational and object-oriented database types.

Figure 8 is a diagram depicting the format of account information databases stored within secondary storage **312** of data processing systems according to **Figure 3B** in a preferred embodiment of the present invention. Table **800** includes entries **802** for each of the customers of a mobile telephone service provider. Account holder field **804** stores the name or identity of each customer. Account number field **806** stores an account number for each customer, which may the customer's telephone number. Use time field **808** stores each customer's total use time on the premises. Date field **810** stores the dates of the use time in question. Field **812** stores the identity of the party which is assuming responsibility for paying for the use time.

Note that **Figure 8** depicts a traditional telephone billing arrangement where customers are billed for charges already accrued. The processes of the present invention are equally applicable when a customer utilizes a pre-paid billing service. In such a case, minutes are simply deducted from a balance maintained by the mobile telephone provider. Any combination of these billing schemes may be used (e.g., the mobile phone user may be a pre-paid customer, while the billed party may pay charges accrued).

Figure 9 is a flowchart representation of a process of performing proximity-based billing intervention in a preferred embodiment of the present invention. The location in question is monitored for the presence of a mobile telephone (step **900**). If a mobile telephone has entered the location (step **902**), the mobile telephone

provider for the mobile telephone is notified that a third-party associated with the location will be assuming the airtime charges for the call (step **904**).

The location continues to be monitored for the presence of the mobile telephone (step **906**). If the mobile telephone has left the location (step **908**), then the mobile telephone provider is directed to resume billing the mobile telephone user (step **910**).

One of ordinary skill in the art will recognize that a number of variations of the present invention exist. For instance, one particularly useful feature that could be added to the embodiment herein described would be a notification to the non-billed party that the billed party has accepted all airtime charges. The notification may be as simple as a chime played in the earpiece of the non-billed party's telephone. It may be a text message or icon transmitted and displayed on display **114** (**Figure 1**) along with the billed party's telephone number or sent via instant messaging for example.

Another possible variation on the present invention involves billing arrangements between customers having different telephone service providers. Service providers would enter into reciprocal agreements to allow billing overrides with different service providers. Service providers would agree to exchange rates, wherein airtime minutes from one service provider would have a relative value vis-à-vis services or features from another service provider. For example, two service providers (A and B) may agree to allow billing overrides between the two service providers with an exchange rate of 3 minutes of A for every 2 minutes of B. Accordingly, a customer of B could be billed for 100 minutes of airtime by a customer

of A. The customer of B would then be billed for only 67 minutes, due to the exchange rate between A and B.

Though business establishments are the most likely candidates for employing the present invention, the invention is not limited to commercial transactions. Any establishment may employ the present invention. For example, an may use the present invention to simplify reimbursements to its employees. For example, an organization may apply the present invention to mobile phone calls made by its employees while on the premises. This eliminates the need for employees to keep track of the business related mobile phone use and then submit a reimbursement request. In this case, the billing intervention would be applied to all mobile phones which are identified as employee phones.

Another example of a non-commercial application of the present invention is college students. Universities may attract students by offering to assume the billing (or a portion of the billing) for mobile phones which are owned by registered students.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and

transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.